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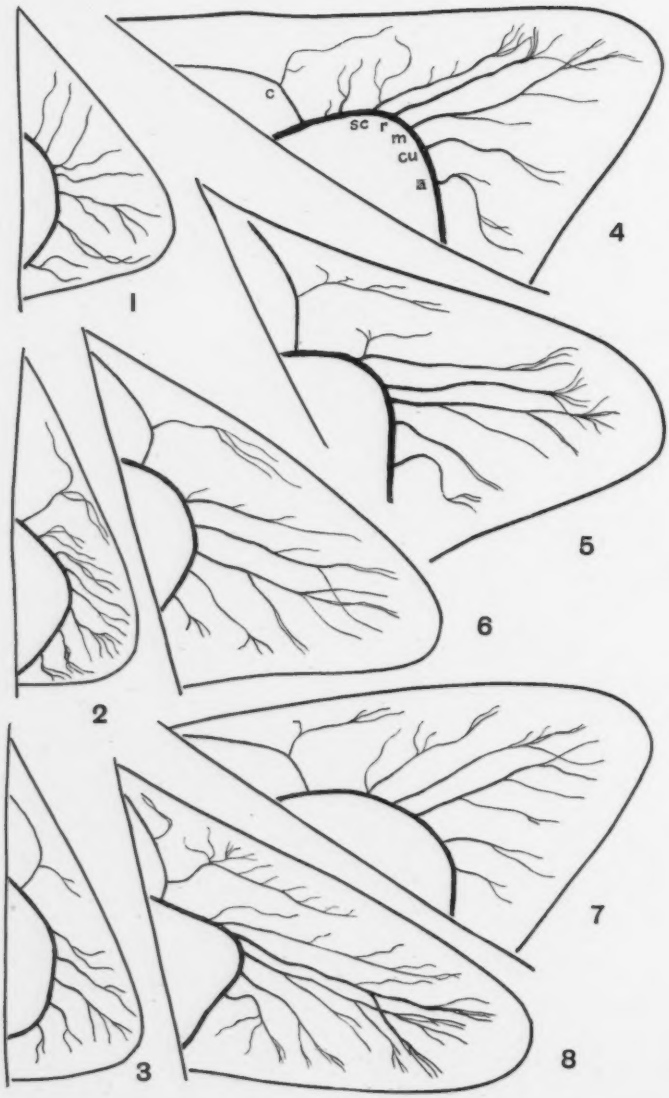

TRACHEATION OF WINGS OF EARLY LARVAL INSTARS OF ANAX JUNIUS.—SCHMIEDER.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA

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The Tracheation of the Wings of Early Larval Instars of Odonata Anisoptera, with Special Reference to the Development of the Radius.

By RUDOLF G. SCHMIEDER, M.A., University of Pennsylvania, Philadelphia.

(Plates X, XI.)

Comstock and Needham in 1898, and Needham in 1903 published an account of the development of the wing venation of the Odonata. In the account of Needham, 1903, the development of the wing veins is traced through a series of larval stages in order to show that the vein lying posterior to *M2*, the subnodal sector of earlier authors, is really the vein *Rs*, and that it has come to lie in this unusual position as the result of a series of evolutionary changes in the history of the dragon fly wing. These evolutionary changes, according to Needham, are indicated in the ontogeny of the larval tracheae. Figs. 1 and 2 in Needham's paper represent drawings of three stages

in the development of the larval wing. These drawings are to show: in fig. 1, A, the primitive condition in which the trachea *Rs* occupies its normal position anterior to *M*1, in fig. 1, B. the second stage, in which *Rs* has come to lie posterior to *M*1 but is still anterior to *M*2, and finally, in fig. 2, the condition obtaining in the full grown larva, in which *Rs* lies posterior to *M*2. The occurrence of these stages in the larval wings constitutes a part of Needham's evidence that the vein lying between *M*2 and *M*3 is the radial sector and is not a true branch of the media.

The work of Tillyard (1922) has again thrown doubt upon the identity of the vein *Rs*, for this author does not concur in Needham's interpretation but states that the *Rs* of Needham is really a branch of the media, although receiving its tracheal supply in part through a branch of *R;* and that the original *Rs* has been cut off by, and become attached to, the media. While admitting that if the ontogenetic stages described by Needham actually occur in the developing wing rudiments of the larva, this would constitute strong evidence in favor of Needham's view, Tillyard doubts that such stages can be demonstrated.

It was suggested to me by Dr. Philip P. Calvert, that in view of the doubts which had thus been cast upon the existence of the two earlier stages described by Needham, it would be desirable to go over the work of that author and examine the tracheation of the earliest larval instars, since an accurate knowledge concerning the condition of the trachea *Rs* at its first appearance and of how it comes to occupy the position it is said to assume in later instars might be of value in solving the difficult problem of the homology of the imaginal vein *Rs*.

The larvae examined were those of *Anax junius* Drury, *Gomphus villosipes* Selys and *Gomphus exilis* Selys. The wing rudiments of these larvae were prepared and mounted essentially after the manner described by Needham. In the case of the younger ones it was necessary, because of the small size of their wings, to cut out the thoracic terga and the first segment of the abdomen in one piece and, without removing or disturbing any of the underlying tissue, to mount the piece thus removed entire. Treated in this way, the wing rudiments

and the delicate tracheae contained in them are subjected to no strain or pressure of any kind and there is practically no danger of the tracheae being displaced from their normal courses. The figures are all from drawings made with the aid of a camera lucida, for it was found that the earlier stages, such as those in which the wings were less than 0.5 mm. in length, could not be photographed, since the high magnifications necessary make it impossible to get all the tracheae in focus together. In the wing measurements given, the term "length" is used to indicate the distance between the mid-point on the line of articulation of the wing with the thoracic tergum and the extreme tip of the wing.

In *Anax*, the smallest larvae possessing wing rudiments which I was able to obtain were 9 to 10 mm. in length. The wings of these larvae were 0.2 to 0.22 mm. long; three such wings, from different larvae, are represented in figs. 1-3. The shortness of these wings compared with their width at base and the less definite arrangement of their tracheae make it immediately apparent that we have to do with a much earlier stage in the development of the wing than in the case of the earliest stages represented by Needham's figures or by Tillyard in his text fig. 3.

In comparing the wings in figs. 1-3, it is noted that there is considerable variation, that there is not a single trachea which is exactly alike in all three figures but that each may vary in the number of its branches and that their arrangement gives but little hint as to the manner of their disposition in the adult. We also note that additional tracheae may often appear between the costa and the subcosta; in fig. 2 there are two such tracheae, in fig. 1 there is one. I am confident in assuming that in all cases the extra tracheae are between *C* and *Sc* and that *M* is always adjacent to *R*, for I have never found, at any stage in *Anax*, any indications of extra tracheae inserted between *R* and *M*. Thus I have found, as Needham did, that in the earliest stage in the development of the wing there are six principal tracheae. The additional tracheae of which there may be one or more inserted between *C* and *Sc*, may persist through later instars but always remain small and are of no importance.

It is noted too, that variability in the number of branches also characterizes the radius and media in this primary stage. In figs. 2 and 3, *R* is two-branched, while in fig. 1 it is unbranched. The media is five-branched in fig. 2, while in figs. 1 and 3 it is in its more usual four-branched condition. Finally it may be noted that the posterior two tracheae are three-branched in fig. 2, and that in figs. 1 and 3 they are two-branched. In regard to the costa it might be mentioned that, at least in *Anax*, this trachea almost always arises not from the same tracheal trunk as do the other wing tracheae, but from a branch of this trunk, the accessory costo-radial trunk, which passes out of the base of the wing. This condition is seen in figs. 2-8; in fig. 1 the costa arises from the same trunk as do the other tracheae. In *Gomphus*, the costa arises either directly from the transverse basal as do the other wing veins, or from the accessory costo-radial trunk as it does in *Anax*.

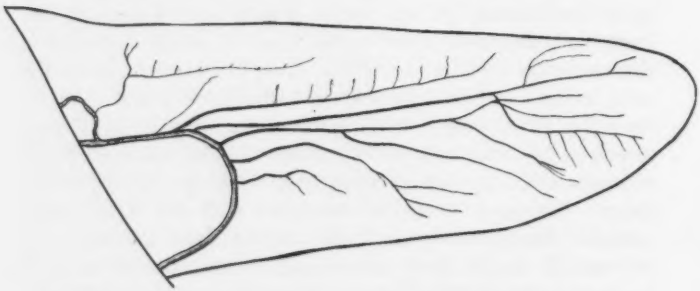
Returning to the radius and observing the course of its branches in the earliest stages, we note that there is no crossing of any branch of this trachea over any part of the media. In fig. 1 the radius is not branched at all and is entirely remote from the media. In figs. 2 and 3 the radius has two branches, the posterior branch being, according to the view of Needham, the radial sector. This posterior branch, which for the present I will continue to refer to as *Rs*, is in this stage entirely free, and remote from the media. This observation apparently agrees with that of Needham, who illustrates such a condition in his fig. 1, A, if we disregard the difference in the sizes of the wings in the two cases. We must, however, remember that the wing rudiments represented in figs. 1-3, are in a much earlier stage of development than that figured by Needham which, he states, was 1 mm. long, as is indicated by their smaller absolute size, the difference in the proportions of length to width and in the great variability in the arrangement and in the number of branches of the various tracheae.

Figs. 4-7 represent the tracheation of the wing rudiments taken from *Anax* larvae whose body length was 13 to 13.5 mm. These larvae are apparently of the instar following upon that of the larvae just discussed, since on frequent collecting trips

during August and September no larvae of an intermediate body length were found, although those of 10 mm. and those of 13 mm. were quite plentiful. The wings of this instar were 0.4 to 0.45 mm. long, the tracheation in them was much less variable than in those of the preceding instar. The additional tracheae, often so prominent in the previous instar, were less frequently observed or were at least comparatively smaller and of little importance. Other tracheal branches, especially those of *R* and *M*, heretofore simple, are in this stage composed of two or more fine branches which tend to cling together. The radius is, in all cases, at least two-branched, a posterior branch *Rs* crosses over the two anterior branches of *M*. In all of the twelve individuals of this instar which were examined the trachea *Rs* always behaved in this way. A single exception is shown in fig. 7. This wing was from the same larva as the wing in fig. 6, which represents the conditions found in all of the other three wings of this larva. The wing in fig. 7 may therefore be considered as a variation having no special significance and not by any means as representing a normal occurrence. We again note that compared with the wing represented by Needham's fig. 1, B, the wings of *Anax*, although only 0.4 mm. in length, have outstripped, in the specialization of tracheal paths as regards *Rs*, wings of *Gomphus* which were (*teste* Needham) 3 mm. in length, whilst in regard to many other features the *Anax* wings are far behind the *Gomphus* wings of Needham. Not only is the wing in Needham's figure much larger and more elongated (its length being greater than its width at base) than the wings in my figures, but the tracheae themselves, with the exception of *Rs*, speak of a more advanced stage of development. All the tracheae, excepting *C*, are comparatively closer together at their origin and along their parallel courses; *Cu* and *A* have taken on quite decidedly the characteristic paths which they assume in anticipation of the formation of the triangle; the nodus and the stigma are already indicated; and finally, the tracheal trunk supplying the wing tracheae describes an arc of a comparatively shorter radius, a condition more typical of later instars.

Fig. 8 represents a wing rudiment of the next succeeding in-

star, the larva being 15 mm. long and the wing 0.65 mm. in length. Here we note again that *Rs* crosses over *M*1 and *M*2. The branches of *R* and *M* are composed in their distal portions of bundles of fine tracheae lying close together and often winding about each other, a condition already noted in the preceding instar and which has now become more pronounced. *C* and *Sc* have also developed a number of fine branches in this instar. This wing too, has many features in addition to its much smaller size, which indicate that it is in an earlier stage of development than that of Needham's fig. 1, B, which shows *Rs* as lying between *M*1 and *M*2.



Text Fig. A.—Wing rudiment from larva of *Anax junius*; length of larva 33 mm., length of wing 1.9 mm.

Finally, in text fig. A, there is represented a wing 1.9 mm. long, taken from a larva 33 mm. long. The wing in this stage is considerably elongated and the fascicled condition of the ends of the branches of *R* and *M* has been abandoned.

(To be continued.)

EXPLANATION OF PLATE X.

Figs. 1-8. Wing rudiments from larvae of *Anax junius*.

Figs. 1-3, Length of larvae 9 to 10 mm., length of wings 0.2 to 0.22 mm.

Figs. 4-7, Length of larvae 13 mm., length of wings 0.4 to 0.45 mm.

Fig. 8, Length of larva 15 mm., length of wing 0.65 mm.

Ovipositional Habit of Pyraustomyia penitalis Coq. (Dip., Tachinidae).

By H. W. ALLEN, Agricultural College, Mississippi.

Pyraustomyia (*Panzeria*) *penitalis* Coq.* is a common Tachinid parasite of the smartweed borer, *Pyrausta ainsliei* Hein. Adults of this parasite were abundant at Columbus, Ohio, during the summer of 1921 and their method of oviposition was several times observed. To the author at least, their rather unique method of spanning the distance from adult fly to concealed host was new, and differed from the varied methods of oviposition and larviposition previously noted.

The smartweed borer infests the cane of one of the more common smartweeds, (*Polygonum pennsylvanicum*), entering by a small hole at the node and developing within short tunnels between the nodes, in its earlier instars in small colonies near the tip, later as solitary larvae in the older succulent joints.

Females of *Pyraustomyia penitalis* in the act of ovipositing were observed to approach an infested node and quickly fasten a minute maggot enclosed in a very thin sheath of chorion, upon the cane, near the entrance hole of the borer. The maggot in all cases emerged from the sheath at once. Some found and entered the tunnel of the borer within a few seconds, while other instances were observed where the young maggot had been unable to find the entrance of the tunnel 20 minutes after oviposition. Maggots emerging from the sheath moved at first on a straight line represented roughly by a prolongation of the longitudinal axis of the sheath, then failing to find the entrance hole of the borer would take a wandering course, frequently raising the anterior end and waving the head in the air. The course of the minute maggot after entering the tunnel of the borer until it appeared within the body of the host was not observed. Young maggots were recovered from the blood of borers a few hours after ovi-

*Several adults were sent to Mr. John Tothill who has recently been working on a revision of this group of Tachinidae. He places Coquillett's *Panzeria penitalis* in the genus *Pyraustomyia*, Can. Ent., Vol. LIII, p. 201.

position, indicating that soon after entering the tunnel, maggots find their host and penetrate its body.

This manner of effecting parasitism seems remarkable in several respects. The host, though a borer and secure during most of its existence from the direct attack of a Tachinid parasite, is highly vulnerable to this specialized method of approach, as is indicated by the frequent high rate of parasitism. When the borer changes from the gregarious to solitary life, it leaves the colony tunnel and crawls on the outside of the cane to a joint lower down, cutting a new entrance there, and at this period of its existence is particularly vulnerable to direct parasite attack. But so far as observed, this parasite takes no interest in exposed larvae. Maggots, as indicated by the cast sheaths, are habitually deposited at distances ranging from about one-fourth inch to over an inch from the borer entrance. Before the parasitic life of the maggot could begin, it was forced to perform the tortuous and difficult journey from the point of oviposition to the entrance hole and then up the tunnel to the host and finally to penetrate the body of the host. So far as observed maggots were invariably placed near infested nodes. Superparasitism was common, several maggot sheaths being commonly found about the entrance containing but one borer. Many borers were found to contain two and three maggots. Females were induced to oviposit freely in small cages when confined with infested canes.

A Peculiar Damselfly Nymph of the Subfamily Thorinae (Odon., Agrionidae).

By JAMES G. NEEDHAM, Cornell University, Ithaca, New York.

Among the aquatic insects collected by Dr. J. C. Bradley on the Cornell Entomological Expedition of 1919-20 to South America, there was one damselfly nymph of form so peculiar I deem it worthy of special notice. When I first saw the specimen in a vial of alcohol I thought that a bur or spiny seed of some kind was stuck to its tail, but when I got at the specimen and undertook to remove the supposed bur I found it to be

the highly modified middle gill that is possessed by all damselfly larvae.

The curiously twisted ventral abdominal gills attached to segments 2 to 7 and bent beneath the abdomen as well as the form of labium and antennae show this nymph to be allied to that of *Cora* obtained by Dr. Calvert in Costa Rica and described by him in *Entomological News*, volume XXII, page 52. I place it, therefore, among the Thorinae. Nymphs of three genera of this group *Thore*, *Euthore* and *Chalcopteryx* remain unknown. The wings of this specimen are badly preserved so that there is no venation to be seen in them that might help to identify the genus. The wings, however, are long and the nymph though small is apparently grown, and on the basis of size alone I hazard the guess that it belongs to the smallest and most highly specialized genus *Chalcopteryx*, or else to one of the smallest members of the genus *Euthore*. Herewith I publish figures drawn by Dr. Hazel E. Branch and a brief description.

Fig. 1. Nymph of a Thorine damselfly from Peru. To the right, a gill of same detached.

Length 17 mm., antennae 2 mm., and modified middle gill 4½ mm. additional. Length of hind femora 4½ mm., width of head 4½ mm.

Color all brown, only the sutures and the tarsi paler. On the top of the head are seven oval bare scars that are somewhat yellowish, three of them transversely placed and conjoined about the middle ocellus and two pairs more laterally placed, one at the same level and almost contiguous to the eye, and one pair farther back and closer together.

Head wider than thorax, abruptly narrowed behind the eye with a broadly rounded occipital notch bordered at either side as viewed from above by a rather sharply projecting angle. Antennae 7-jointed, the 7th joint pale and feebly differentiated, the second joint longest, as long as joints 3 to 7 taken together, and one-half longer than the basal joint and twice as long as the third joint alone. There is a line of flat scale-like hairs bordering the inner margin of this long second joint, and a similar patch on the side of the head before the eye, and a dense fringe of scurfy hairs around the front edge of the labrum. The hinge of the

labium extends rearward only to the middle of the prothorax, its median lobe is broadly rounded and cleft only to the level of the base of the lateral lobes. Each lateral lobe is 3-cleft at the apex into two outer,

Fig. 2. Mouth parts: *a*, mandible; *b*, end of labium from within; *c*, more enlarged tip of lateral lobe of labium.

incurved subacute teeth, and one inner obliquely truncate and scarcely falcate tooth.

At each side of the pronotum is the usual pair of projecting lateral angles, the rear one being slightly larger; the legs are brown with yellowish tarsi, the femora bare, strongly longitudinally carinate and the tibiae similar, very weakly carinate. Wing tips extend posteriorly to abdominal segment 6. There are high, erect dorsal hooks on segments 2 to 9. Gills on 2 to 7 decurved and twisted at the tip, three-jointed, the basal joint bearing very short filaments along one side. There are no lateral spines.

The lateral gills are wanting. The mid-dorsal gill is of extraordinary form, inflated, heavily chitinized, pedicellate at base and compressed at apex, where it is bifurcated and slightly carinate beneath, where it bears a strong sharp tooth at each end of the inflated portion. There is also a pair of thorn-like processes projecting laterally from the middle of this portion.

A single ♀ specimen from Enañas del Pichis, Peru (east slope of the Andes), July 4, 1920.

Keys to the Syrphid Genus Sphegina Meigen (Dip.).

By J. R. Malloch, U. S. Biological Survey, Washington, D. C.

The genus *Sphegina* is most closely related to *Neoascia* Williston and is separable from it by the conspicuously concave face, the sloping instead of erect outer cross-vein, lack of distinct hairs on upper half of sternopleura (except in one or two species, and in these they are very inconspicuous), much shorter third antennal segment, and the presence of a more or

less complete impressed curved line extending from humerus on each side to the transverse median impression.

The species vary much in color but in structure they are quite constant. No use has previously been made of the armature of the fifth sternite of the males in systematic papers though its shape has been mentioned, and previous authors have omitted any mention of the curved thoracic depression.

Nothing is known of the larval habits of the genus; the adults occur on various flowers.

Key to Males.

1. Hind tibia with a distinct elevated chitinized beaklike projection at apex on ventral surface which is either acutely pointed or compressed from each side; apical abdominal sternite without minute spinules, only fine hairs present.....2
—Hind tibia either transverse at apex on ventral side or with a short apically rounded scooplike production.....4
2. Small species, about 5 mm. in length; black and yellow in color, the apical process on hind tibia beaklike and slightly curved; hind trochanters without minute black setulae.....**flavomaculata** Malloch.
—Large species, 8-9 mm. in length.....3
3. Reddish species; hind femora unicolorous rufous; hind tibia with the apical process rounded at tip and compressed from each side; hind trochanters without black setulae,
armatipes Malloch var. **rufa** Malloch.
—Black species with yellow markings; hind femora largely black; hind tibia with the apical process beaklike, slightly curved, not compressed from both sides; hind trochanters with some black setulae.....**armatipes** Malloch.
4. Scutellum transverse at apex, the two long setulose hairs separated by more than half the basal width of scutellum; hairs at apices of fourth and fifth abdominal sternites strong, but no short stout spinules present, fifth produced lobuliform at posterior angle on left side.....**occidentalis** Malloch.
—Scutellum regularly rounded posteriorly, the setulose marginal hairs if only two in number separated by much less than half the basal width of scutellum.....5
5. At least the fifth sternite with some short setulae or spinules apically.....6
—No short spinules on fifth sternite, only fine hairs present.....11
6. Both fourth and fifth sternites with some short spinules apically..7
—Only the fifth sternite with short spinules apically.....9
7. Fifth abdominal sternite almost transverse at apex, not noticeably produced in the form of a rounded lobe at left posterior angle; the

greater part of center of disc of both fifth and fourth sternites with short stubby spines; hind tibia produced scooplike at apex on ventral side..... .....**keeniana** Williston.

—Fifth abdominal sternite with a central concavity in posterior margin, the left posterior angle drawn out into a rounded lobe; hind tibia transverse at apex on ventral side.....8

8. Black spinules of fourth sternite conspicuous, stubby, extending well on to disc; fifth tergite with a large rounded lobe; fourth tergite without long hairs on posterior lateral angles.... ...**lobata** Loew.

—Black spinules on fourth sternite very sparse and fine, confined to extreme margin of haired part; fifth tergite with a small rounded lobe; fourth tergite with long soft hairs on each posterior lateral angle..... .....**punctata** Cole.

9. Spinules of fifth sternite black and stubby, many fine hairs laterad of them on the two rounded slightly elevated areas. .**rufiventris** Loew.

—Spinules of fifth sternite reddish, elongated on the two rounded elevations laterad of the median line.....10

10. Fifth sternite with a very large rounded lobe on left side at posterior angle which is not heavily chitinized and is separated from remainder of segment by a depression, the hairs long and not very strong; outer crossvein and fourth vein beyond bend at apex infuscated.....**petiolata** Coquillett.

—Fifth sternite with a small rounded lobe which is as heavily chitinized as the remainder of segment and not separated from it by a depression, the hairs shorter and stronger; veins not infuscated..... .....**campanulata** Robertson.

11. Hairs on frons erect, conspicuous, the longest as long as the entire antenna; abdomen inconspicuously pedunculate; arista very little longer than antenna, densely pubescent.....**infuscata** Loew.

—Hairs of frons decumbent, short and inconspicuous, the longest not longer than second antennal segment; abdomen conspicuously pedunculate 12

12. Fifth abdominal sternite with a large lobe at right hind angle which is over half as long as the sternite at middle; only the apical segment of tarsi deep black, the subapical one brownish **lobulifera** sp. n.

—Fifth abdominal sternite not distinctly lobed as above.....13

13. Hind tibia with a slight but distinct scooplike production of the ventral surface apically; arista gradually tapered from base and distinctly pubescent; small species, 5-6 mm. in length, **flavimana** Malloch.

—Hind tibia not produced as above, transverse at apex; arista swollen on about a fourth of its length from base and nearly bare; larger species, 8 mm. in length.....**californica** Malloch.

Key to Females.

1. Third (fourth) tergite of abdomen distinctly flared apically, fourth with a deep notch in middle of posterior margin; the curved linear

thoracic depression distinct and complete.....**monticola** Malloch.
—Third tergite not flared at apex.....2
2. The curved linear depression of thorax extending from humerus to the transverse median depressed line not distinct except near the latter; third sternite distinctly longer than wide.....3
—The curved linear depression distinct and complete.....5
3. Hind femur with two black bands one just beyond middle and the other at apex; humeri pale yellow; disc of mesonotum black, entirely without vittae; fore and mid tarsi yellow .....**biannulata** Malloch.
—Hind femora yellow, without black annuli; thorax black or yellow, with three or more or less distinct vittae; apical two segments of fore and mid tarsi black or brown.....4
4. Third antennal segment yellow..... **campanulata** Robertson.
—Third antennal segment black or fuscous .....**rufiventris** Loew.
5. Anterior width of frons about one-third of the head width; third sternite distinctly wider at apex than long in middle; inner cross-vein not more than two-fifths from base of discal cell; scutellum usually with more than two long setulose marginal hairs, **infuscata** Loew.
—Anterior width of frons much less than one-third of the head width; scutellum with two setulose marginal hairs.....6
6. Scutellum distinctly transverse apically, the two long setulose hairs separated by more than half the width of scutellum; third sternite longer than wide.....7
—Scutellum regularly rounded apically, the two setulose hairs separated by less than one-fourth of the basal width of scutellum....8
7. Hind femur conspicuously compressed on lower half apically, widest part distinctly beyond middle; thorax black, abdomen rufous **occidentalis** Malloch.
—Hind femur very slightly compressed apically, widest part close to middle; thorax and abdomen yellow..... .....**punctata** Cole.
8. Fifth (fourth visible) tergite with a shallow transverse rounded concavity before apex which causes the tip of the segment to flare upwards very slightly, the hairs on this segment and on fifth sternite long and soft; third sternite wider than long; a robust species, about 8 mm. in length.....**armatipes** Malloch.
—Fifth tergite normal in shape; third sternite longer than wide; smaller species, not over 6 mm. in length.....9
9. Fore and mid tarsi with the apical two segments deep black, **keeniana** Williston.
—Fore and mid tarsi yellow, the apical two segments hardly darker, **flavimana** Malloch.

Sphegina lobulifera sp. n.

♂.—Shining black, antennae, lower half of face and a broad fascia on basal half of third tergite of abdomen yellow. Legs yellow, apical

tarsal segment on all legs deep black, subapical one brownish; apical half of hind femora, a mark on apical half of hind tibiae, and most of basal segment of hind tarsi black. Cross-veins and tips of wings slightly clouded.

Head as in *californica*. None of the abdominal sternites with setulae, the peduncle moderately narrow, as in *lobata*. Hind femora much swollen; hind tibiae transverse at apices. Length, 7 mm.

Type, Plummers Island, Maryland, April 30, 1922, on flowers of *Alliaria officinalis* (H. L. Viereck). Type in U. S. National Museum.

This species has the cross-veins more erect and the lower posterior angle of the first posterior cell less rounded than most species. The inner cross-vein is but little in front of middle of discal cell.

A New North American Genus of Cydnidae (Hem.).

By E. P. Van Duzee, San Francisco, California,* Curator, Department of Entomology, California Academy of Sciences.

PSECTROCEPHALUS new genus

Allied to *Pangaeus* but wanting ocelli, and anterior margin of the head armed with comb-teeth. Ovate, subdepressed, sides nearly parallel. Head broadly rounded before; cheeks approaching at apex of tylus but scarcely forming a notch there; edge strongly reflexed, the depressed submargin armed with alternating spines and bristles; eyes small, closely set against anterior angles of pronotum. Ocelli wanting. Antennae five-jointed; segment II thinner and slightly longer than those following. Rostrum reaching intermediate coxae; segment I attaining base of head, III longest and thickest. Pronotum subquadrate; anterior margin shallowly excavated, flattened and punctate but immarginate, armed with one bristle behind inner angle of each eye; sides ciliate, slenderly but acutely carinate; disk without transverse depression. Scutellum a little longer than wide, apex narrowly rounded; punctate, with base nearly smooth. Corium scarcely exceeding scutellum, quite uniformly and coarsely punctured, its apex broadly, feebly arcuate; costa ciliate nearly to apex, the

*Contributions from the California Academy of Sciences, No. 138.

connexivum ciliate beyond that point. Osteole without a sulcus, opening behind a tumid elevation. Feet as in *Pangaeus*.

This is the first American genus of Cydnidae known to me in which the ocelli are entirely wanting. This character, with the spinose margin of the head and longer second antennal segment will serve to separate it from *Pangaeus*, its nearest relative.

Type: *Psectrocephalus caecus* n. sp.

Psectrocephalus caecus new species.

Black, coarsely punctate; antennae testaceous; marginal cilia rufous. Length 5 mm.

Vertex and tylus nearly smooth, the latter transversely wrinkled toward apex; cheeks rugosely punctate; marginal spines as long as thickness of 3d antennal segment; cilia about five times the length of the spines and nearly equal to median width of cheeks; anterior submargin armed with a long bristle either side at base of bucculae; anterior disk of pronotum continuously smooth, the lunate anterior margin and broad sides punctate, as is the posterior lobe; punctures on scutellum shallow, becoming closer posteriorly, the base nearly smooth; corium closely, deeply punctate; membrane attaining apex of abdomen; beneath polished, impunctate, the osteolar area opaque.

Color deep black when mature, polished; rostrum and antennae piceotestaceous, segments II and III of antennae darker; tarsi pale; marginal cilia and eyes rufous; membrane white, in one individual shorter and sooty black.

Described from two male and three female examples taken as follows: Pasadena, California, October 12, 1916, one pair taken among ants under a stone by Mr. J. O. Martin; La Jolla, California, one female taken by me under a stone, on the hill back of Scripps' Institution, July 27, 1913; Laguna Beach, California, one male taken by Prof. E. O. Essig, July 15, 1913, and one female taken by Mr. C. T. Dodds at same place, July 7, 1921, both under stones.

Holotype, male, No. 926, and allotype, female, No. 927, Museum California Academy of Sciences, from Pasadena. Paratypes in collections of the Academy, in that of Mr. Harold M. Jeancon and in that of the author. This species undoubtedly is an inhabitant of ants' nests and may be common in such situations.

Studies in the Genus Hetaerius (Col., Histeridae).

By J. O. MARTIN, Berkeley, California.

All of the members of this interesting genus of the Histeridae are, so far as at present known, myrmecophilous and aside from this, little exact knowledge exists as to their life histories or their relations to their hosts. Although they live at the ants' expense, they show no signs of the degeneracy so often accompanying parasitism and seem to be as efficient as any of the family to which they belong. They have well developed wings and can use them and their legs, while apparently awkward, get them over the ground at a surprising rate. The compact body of these beetles is strongly chitinized and with its retractile head and antennae, its broad flat legs, serving as additional abdominal protection, offers impregnable defense to attacks of the ants. It is quite evident, from numerous observations, that the ants tolerate these beetles owing to secretions which they exude and of which the ants are very fond. These secretions are believed to arise at the basal thoracic angles and there are specializations at these points which seem to support this idea. Also the ants are known to favor this region, even to the extent of gnawing holes through the thoracic walls, presumably while the chitin is soft directly after emergence from the pupa.

The members of this genus are all of small size, varying in length from one and a half to three millimeters. The general form of the body is quadrately oval with variations in the ratio of length to breadth as well as to convexity. The general body color does not vary greatly in the different species, being a reddish brown similar to that common to many other insects of myrmecophilous habits. In vestiture there is a variation from almost complete nudity, to a considerable degree of hairiness. The hairs themselves vary from plain bristles, through different degrees of plumosity to a squamose type which is generally plumose and recumbent. These hairs offer useful taxonomic characters, but should be used with caution as I am convinced that the ants frequently gnaw some of them off.

The form of the prothorax is a very useful means of specific determination and as there is a very unusual development of

this sclerite, it seems advisable to designate the various features in order to make clear the terms used in descriptions. The dorsal surface of the prothorax is divided into three main regions by two oblique, converging sulci, extending from the basal to apical margins and dividing the surface into a central *discal area*, with two bordering *lateral areas* of which the discal area is the largest. The sulci which produce this division are called the *oblique sulci*. The discal area is convex and highest along its central portion, sloping gradually toward the apex and also toward the sulci before reaching which it begins to curve upward to a carinate edge forming the inner border of the oblique sulcus. The depression which parallels this sulcus and is a part of the discal area, is, in all of the species I have examined, smooth, shining and impunctate, while the raised portion of the discal area may be variously punctured and hairy; I shall call this depressed portion of the discal area the *oblique depression*. The lateral areas lying between the oblique sulcus and the lateral margin, are various in shape and in all cases are extended further cephalad than the discal area. The inner margin of these lateral areas is carinate and forms the outer border of the oblique sulcus. Each lateral area is divided near its basal third by a *transverse sulcus* which may vary in shape and depth in the various species. The portion of the lateral area cephalad of the transverse sulcus is generally punctate with varying hairiness and is inclined to rugosity, while the smaller portion caudad of the sulcus generally has its inner surface at least, smooth and shining. The surface of this division is, as a rule, convex and blister-like in shape; I shall therefore speak of it as the *bulla*. It is about this bulla that the ants seem to center their attentions and it seems probable that here is the chief seat of glandular secretion.

The divisions of the prothorax above mentioned are to be found in all of our species at present described but in *Hetaerius ferrugineus*, the type of the genus, neither the oblique nor transverse sulci are present. The oblique sulcus is indicated by two parallel raised lines but there is no sulcus between them. Of the transverse sulcus there is not the slightest indication, neither is there any development of the bulla. In all other

respects, however, this species seems to agree with our American species.

In the pygidium and propygidium I can find no other specific characters than the variation in punctation and hairiness. These variations, however, seem to be constant and offer a ready means of separating the species. I have carefully examined a series of eighteen specimens of *Hetaerius zelus* Fall, and over twenty-five of *Hetaerius tristriatus* Horn, for sexual characters, but have not been able to detect any here or elsewhere.

In the prosternum we encounter one of the most valuable series of variations for specific separation as well as generic division. There are two types of prosternum, separating the genus into two well defined groups, one I shall call the subcylindrical, the other the depressed type. In the first or subcylindrical type, a ventral view of the prosternum shows a sort of vase form with its base between the coxae and its bulbous tip at the cephalic extremity. The mesothoracic contact is emarginate and extended into two rounded angular lobes around the ends of the coxae. Between the coxae the sides are suddenly convergent, followed by a gradual divergence to a maximum at about the middle of the prosternum, at which point there is a convergence to a neck-like constriction, then an expansion to a bulbous extremity which has a pit-like depression on its end. The cephalic portion of this prosternal ridge is subcylindrical in bas-relief, growing less so at the middle and becoming flat between the coxae. The second or depressed type is the same in general plan as the above except that there is a varying slope away from the summit of the prosternal ridge instead of an abrupt drop as in the former. The mesothoracic contact is margined in both types and the extension of the bordering carina along the flattened surface of the ridge produces the *margined area.*

In the head we find some differences both in shape and punctuation, but owing to its retraction, the front is the part most often made use of. The antennae also are difficult to see and for this reason have probably not been mentioned in descriptions.

The legs differ considerably in their proportions but as it requires special manipulation to measure them, I have tried

to avoid the use of this character except where it is easily noted.

As a result of the present study I have recognized eighteen species, two east of the Rocky Mountains and the remainder from the Pacific side of the divide. I am confident that there are still others awaiting discovery, especially in the higher altitudes of the Sierras. Comparison with a paratype has convinced me that my species *nitidus* is synonymous with *exiguus* Mann, also that the description of the latter species was rather incomplete. Since Horn's "Synopsis of the Histeridae," 1873* there has been no attempt to tabulate the species of this genus and as there were then but three known species, I offer the following table as a help in future studies of this genus.

Hetaerius vandykei n. sp.

Form oblong oval, ratio of extreme length to breadth as seven to five. Color fulvo-ferruginous; punctate and hairy on all parts of the body except the prosternum; punctures coarse, uniform and fairly close together; hairs except where elsewhere noted fine, long, suberect and fulvous.

Head at vertex nearly flat, coarsely, evenly punctate and hairy; epistoma and labrum smooth, shining, impunctate; front very shallowly impressed.

Prothorax less than twice as wide as long; sides evenly rounded from apex to transverse sulcus, which is rounded at bottom and rather deeply impressed. Bulla punctate and hairy on the outer two-thirds of its surface with stiff, inward curving, plumose hairs. These hairs are coarser than the hairs of the discal area. Discal area coarsely, evenly, punctured, each puncture with a long, suberect, soft yellow hair; punctures and hairs of this area extend further into the oblique depression than in any other species I have examined. Lateral area coarsely punctured and hairy; hairs along the margin coarser and castaneous in color.

Elytra evenly, closely, punctate and hairy; first dorsal stria extends three-fourths the distance to apex, second not quite reaching apex.

Pygidium and propygidium punctate and hairy, each puncture marked by a slightly curved, fine, depressed line in the chitin; punctures somewhat less closely together than on upper surface, hairs depressed.

Prosternum of the depressed type; carinae of the margined area broadly convergent between the coxae, then diverging to one-half the length of the prosternum, then suddenly convergent, becoming parallel at tips, leaving the margined area open at its cephalic end. Prosternum

* Proc. Am. Phil. Soc. XIII, 1873, p. 303.

punctate, shining and but for a few coarse hairs between the coxae, naked. Meso- and metasternum punctate and hairy, hairs depressed, where the legs cover these sclerites in repose there are no hairs. Legs hairy. The hairs on under surface of body and legs are finely plumose and not as long as those on the thorax and elytra. Length 1.5 mm.; width 1+ mm.

Described from an unique in the collection of Dr. E. C. Van Dyke, who collected it in the Yosemite Valley, California, and in whose collection the type remains.

Hetaerius pilosus n. sp.

Form broadly quadrate oval, ratio of extreme length to breadth, three to two. Color fulvo-ferruginous. Shining throughout.

Head at vertex very slightly concave; finely, closely punctate, minutely rugose between the punctures which deadens the surface lustre on vertex and front, punctures with long, curved, golden yellow hairs; labrum and epistoma shining but minutely rugose.

Thorax twice as broad as long; disc smooth, shining, moderately punctate each with a long, very fine, curved, yellow hair. Bulla punctate and hairy on outer two-thirds, inner surface smooth and shining. Transverse sulcus deep and broad at bottom. Lateral area punctate and hairy; these hairs and those on bulla coarser than those on the disc; oblique sulcus carinate on both sides to base of elytra.

Elytra smooth, shining, evenly, moderately punctured, punctures fine, each one bearing a long, fine, curved, suberect hair which tapers to a very fine, long point. First dorsal stria extends three-fourths the distance to the tip of elytra; all the others reach apex; striae fine.

Pygidium smooth, shining, impunctate; propygidium smooth, shining, punctate, punctures more widely dispersed than on upper surface of body, each with a long pilose hair.

Prosternum of the depressed type; carinae of the margined area convergent between the coxae, thence gradually divergent to one-half the length of prosternum at which point they converge in a nearly straight line meeting in a sharply rounded tip, thus closing area in front; surface of margined area minutely acinose; remainder of prosternal surface punctate and acinose, punctures without hairs; cephalic apex of prosternum slightly emarginate and broadly depressed at tip of ridge. Meso- and metasternum and abdominal segments smooth, shining, impunctate. Legs smooth, shining and rather widely punctured, punctures with short hairs. Length 2 mm.; width 1.5 mm.

A single example taken in the nest of a small dark ant at Cypress Ridge, Marin County, California. *Type* in my own collection.

This species is close to *helenae* Mann from Mexico but, according to Mr. H. C. Fall, who kindly compared it with the

type, it differs from that species in being more densely hairy with no trace of regularity in the arrangement of the elytral hairs, which in *helenae* are in definite longitudinal series. In *pilosus* the margined area of the prosternum is closed in front while in *helenae* it is open or in some cases nearly closed. In *pilosus* the propygidium is hairy all over.

(To be continued.)

Early Stages of Noropsis hieroglyphica Cram. (Lepidoptera, Noctuidae).

By F. H. BENJAMIN, Agricultural College, Mississippi.

Larva.—Head, bright, shining, greenish-brown, clypeus whitish, mandibles black, antennae white at base with last two segments black. *Body* and *thorax,* transversely striped with three or four distinct black stripes to each segment, one of these stripes being broadest and most conspicuous, and this stripe broadening out on dorsum and each latex to form an interrupted dorsal line, and a dorso-lateral line on each side. The transverse stripes do not go around the entire body, but end in a ventro-lateral longitudinal black stripe below the spiracles. This stripe is broken to surround a small spot of ground color on the segment before the prolegs, and above each of the prolegs except the anal pair. The spiracles themselves are surrounded by black, resembling small black dots. A black dorsal plate on the first abdominal segment, divided cephalo-caudad by a medial very faint line of ground color, and sometimes interrupted by a more conspicuous transverse band of ground color. General ground color bluish-slate with somewhat of a greenish cast above the ventro-lateral line; underneath, lighter, with the greenish cast stronger and more pronounced. *True legs,* black. *Prolegs,* blackish with yellowish-green in the middle. *Anal prolegs,* black. All prolegs very strongly chitinized, giving them a peculiar shining appearance. *Anal plate,* yellowish green marked by black cephalad, with a tendency for this black to surround the yellowish green by being very faintly present on the lateral and caudal borders of the plate. Length of larva 45 mm. Diameter 7 mm. Head 4x4 mm.

Pupa.—Reddish at first, turning darker to a very dark reddish-brown almost blackish; the ventral part of the abdominal segments lighter. *Cremaster,* with two spine-like processes extending at about 45 degree angles from an imaginary mesal line, with no ordinary setae visible. *Prothoracic legs,* reaching cephalad to eye pieces. *Mesothoracic legs,* not reaching as far cephalad. *Prothoracic femora,* not visible except as a slight widening between sutures. *Dorsum,* of abdominal segments pebbled with large raised granulations; between the segments are fine granulations, those on the cephalic end coarser than those on the caudal end, giving a sandpaper-like appearance. *Spiracles,* ovate, slightly

depressed caudad; with a raised flattened-crescent-shaped ridge near their cephalic margin. *Meso* and *metathoracic spiracles*, similar to and unmodified except in the same manner as the abdominal ones. *Sutures*, all deeply impressed. Length of pupa 15-17 mm. Breadth 5-5.5 mm.

The characters used in this description are the same as those used by Miss Edna Mosher in Bull. Ill. Nat. Hist. Surv. XII, 108-112, 1916, and would place the insect in her version of the Hadeninae.

Cocoon.—Several spun beside, above and below each other, in crotches of branches. The cocoon is made out of thin, coarse silk with fragments of leaves and bits of rubbish of various sorts covering the outside. The whole appears to have been cemented together by a fluid which hardens into a stiff glassy substance. Shape oval, about 20 mm. long and half as broad through the middle.

Temnostoma bombylans Linne Doubtfully American (Syrphidae, Diptera)

For some time I have had grave doubts as to the authenticity of the records of *Temnostoma bombylans* Linné from this country and have taken the trouble to get a specimen of the species from Europe, kindly supplied me by Dr. M. Bezzi, for comparison with our specimens. I find that there are differences between the specimens in our collections that do duty for that species and the European specimen. In fact I consider that there are two valid species, both described, from America, neither of which is *bombylans*. I have seen the type of *trifasciata* Robertson, sent to me by the describer, and have received data from Mr. Nathan Banks on the type of *obscura* Loew. I append a diagnosis for distinguishing the forms involved.

1. Third and fourth tergites in male slightly bluish, and with short decumbent black setulose hairs beyond the pale fasciae, fifth tergite in female similar to fourth; narrowest part of frons distinctly wider than anterior ocellus; base of male hypopygium with black hairs; tarsi of mid and hind legs in male entirely yellow.....*trifasciata* Robertson.
— Third and fourth tergites in both sexes with yellowish or brownish hairs beyond the pale fasciae, which are rather fine; narrowest part of frons not wider than anterior ocellus.....2
2. Hairs on fourth tergite and base of hypopygium pale yellow, and rather long and soft; tarsi of mid and hind legs entirely yellow, *obscura* Loew.
— Hairs on fourth tergite and base of hypopygium brown, shorter and stronger; apical two tarsal segments on mid and hind legs black, *bombylans* Linné.

The male hypopygia appear to offer very good characters for the separation of the three species.—J. R. Malloch, Bureau of Biological Survey, Washington, D. C.

ENTOMOLOGICAL NEWS

PHILADELPHIA, PA., NOVEMBER, 1922.

Insect Surveys.

In 1917, after the United States had entered the World War, the importance of increasing crop production by the control of injurious insects was immediately recognized by entomologists, and Dr. L. O. Howard, as Chief of the Federal Bureau of Entomology, issued a circular, republished on the editorial page of the NEWS for May, 1917, page 229, inviting co-operation in the reporting of insect pests. With the data, which it was hoped, would be sent to Washington,

> the central office will be able to tabulate and map the occurrence of all injurious pests and to indicate to the men in the field the sections which are threatened with insect damage and the means for combatting same. With this information it will be possible to conduct a vigorous campaign against threatening pests.

The plan thus proposed resulted in the "Emergency Entomological Service," the reports of which appeared in mimeographed form and extracts from them are to be found in the NEWS for June, 1917 (page 283), and subsequent numbers.

It is evident that the data gathered during a period of war are also useful in times of peace, and the American Association of Economic Entomologists, at its last annual meeting, recommended that a National Insect Pest Survey be organized under the direction of the Bureau of Entomology. Dr. Howard arranged for such a survey under the charge of Mr. J. A. Hyslop and Bulletin No. 1103 of the United States Department of Agriculture, dated July, 1922, gives the first results of the Survey. It is by Mr. Hyslop and is entitled *Summary of Insect Conditions throughout the United States during* 1921. It reads:

> The object of the insect-pest survey is to collect accurate and detailed information on the occurrence, distribution, ecology and relative destructiveness of insect pests throughout the United States, and to study this

[*sic*] data from month to month and year to year with relation to the several factors that influence insect abundance. The results to be obtained from this undertaking over a series of years are manifold; we should be able to throw light on the reasons for the cyclic appearance of certain insect pests, the gradual shift of regions of destructive abundance, the limiting barriers to normal dispersal, the directive influences that determine the paths of insect diffusion, and the relation of climatology, geography, topography and geology, as well as biological complexes, to insect distribution and abundance. This is the necessary foundation for the next advance step in economic entomology, *entomological forecasting*.

The degree to which this Bulletin realizes these high hopes must be decided by those who read it. The object is one well worthy of the support of both pure and applied entomologists, since it lies within the fields of both classes of students. It appeals to those without as well as within the Bureau as, for example, to Mr. John J. Davis, who has argued for *An Indiana Insect Survey* in the Proceedings of the Indiana Academy of Science. Mr. Davis would

explore, exploit, record, map, collect and study the insect fauna of Indiana, determine the occurrence and range of all insects of the state and study their relation to plants, animals, human welfare, etc. Such a survey would include a study of the relations of insects to changing conditions, that is, swamp areas being reclaimed by drainage, peat bogs, sand areas and the like, being put under cultivation for the first time, etc. It would also include studies of the small lake areas, caves and similar places.

May all these surveys be carried out in detail!

Notes and News.

ENTOMOLOGICAL GLEANINGS FROM ALL QUARTERS OF THE GLOBE

Protoparce rustica in Florida (Lep.: Sphingidae) and Mr. T. L. Mead

Mr. Theodore L. Mead has sent us a moth, *Protoparce rustica*. He says the caterpillar feeds on *Callicarpa americana*, down at his home, Oviedo, Florida. The larva of this species appears to have a variety of food plants. The life history is well illustrated in ENTOMOLOGICAL NEWS, 1900, xi, 485. Mr. Mead has not been collecting insects for forty years but still takes an interest in them and gets specimens for friends in this country and Europe. He was a famous collector and writer in the past and his work is known to most Lepidopterists.—H. SKINNER.

The University of Michigan-Williamson Expedition to Brazil.

The Expedition made collections in the vicinity of Pará (see the NEWS for October, page 244), August 1-10. On August 13, Mr. John W. Strohm sailed from Pará for New York, with a snake chest, another box of reptiles, etc., one trunk solid with dragonflies, a wooden chest full of unnecessary supplies and other impedimenta. Mr. Jesse H. Williamson remained at Pará until the morning of August 18, when he took steamer for Rio de Janeiro. There was much cloudiness and some heavy rain during their stay at Pará and on August 17 Mr. Williamson wrote: "Weather seems to be getting worse here instead of better;" on August 8: "Here, as elsewhere on the trip, all say the season is unusual." As to the Odonate fauna of Pará he wrote (Aug. 11): "Most things are the same as, or so similar that I detect no difference from, the Rio Madeira specimens." On Aug. 8 the Odonata of the Expedition were reckoned at 9029 specimens of 166 species.

The Authorship of the Lepidoptera Described in the Encyclopédie Méthodique, Vol. IX.

A recent examination of the descriptions of Hesperiidae in this work led me to the interesting discovery that the authorship of all the Lepidoptera should be attributed to Godart, and not to Latreille, as is commonly done. This was first disclosed in the footnote to *Hesperia godart* on page 722, and a reference to Latreille's introduction added other evidence in support of the conclusion.

The title page of the volume would lead one to expect joint authorship, at least, since it mentions Latreille as author with the assistance of Godart, but the passages by Latreille which are mentioned above disclaim all responsibility for the descriptions of species and give full credit to Godart.* The pertinent lines of the introduction read thus: "A l'exception des généralités préliminaires, que je m'etois réservées, cet article Papillon lui [Godart] est absolument propre; et si la justice ne me commandoit point cet aveu, je ne craindrois point d'y mettre mon nom." (With the exception of the preliminary general remarks, which I had reserved for myself, this article on butterflies is absolutely his own; and if justice did not command this acknowledgment I would not fear to place my name here). Certainly this is definite enough

*At the suggestion of the editor, Dr. P. P. Calvert, I am adding the wording of the title page of the volume under discussion. It is as follows: "Encyclopédie-Méthodique—Histoire Naturelle.—Entomologie. ou Histoire Naturelle—des Crustaces, des Arachnides et des Insectes.—Par M. Latreille,—Membre de l'Institut, Académie Royale des Sciences, etc.—Tome Neuvième.—Par M. Latreille, de l'Académie des Sciences, et M. Godart,—ancien Proviseur du Lycée de Bonn, etc.—a Paris,—Chez Mme. Veuve a Gasse, Imprimeur-Libraire, rue des Poitevins, No. 6 —MDCCCXIX."—A. W. L.

in itself, but we find additional confirmation in the footnote to *H. godart*. This footnote does not bear Latreille's name, but its tenor indicates him as writer beyond reasonable doubt. The passage reads, in part: "Je n'ai autre part à son travail que celle de lui avoir fourni des moyens d'execution et de l'avoir aidè de mes conseils" (I have no other part in his work than that of having furnished him the means of its execution, and of having aided him with my advice).

One rather contradictory point is the appearance in this work of the species *Hesperia godart*, since it would be rather poor taste in an author to name a species for himself. This is counterbalanced, however, by the appearance on page 799 of another new species under the name of *Castnia latreille!*

The case certainly favors Godart's authorship of these species, in spite of the common attachment of Latreille's name to them, and it seems to the writer a matter or sheer justice that the change should be made. A thought is suggested by this, *viz.*, that it is all too easy to be careless about reading introductory matter, perhaps more in systematic treatises than in others.—A. W. LINDSEY, M. S., PH. D., Denison University, Granville, Ohio.

A Note on Timema californicum Scudder (Orthoptera; Phasmidae).

This strange little Phasmid has attracted the attention of the present writer at various times during the past few years, with the result that it is possible to add a few field notes to those given by Hebard in the latest discussion of the species[1].

In the case of this particular species the only food plant indicated by Hebard is fir, although *T. chumash* Hebard, the only other member of the genus is recorded as having been swept from *Ceanothus*. I have at various times taken single specimens of *T. californicum* purely by accident, finding them upon clothing or insect net after passing through the "chapparal" (which is simply the western word for brush) with which many of our hills are covered. As the "chamise," *Adenostoma fasciculatum*, is the most abundant member of the chapparal association it appeared probable that this was the normal host. However, a visit to the brush-covered top of Loma Prieta Mountain near San José, California (altitude 3000 feet) on June fourth, 1921, produced evidence that the normal host is really another shrub, the "silk tassel," *Garrya elliptica*. Of twenty specimens secured, eighteen were jarred from one or two shrubs of this particular plant, one was found on the ground and one was taken in general sweeping. None were found on *Adenostoma*. The species is evidently abundant, if sought for in the right time and place, for scarcely a quarter of an hour was necessary to obtain these.

The published descriptions of the species have evidently been based

[1] *The genus Timema*, etc., Hebard, *Ent. News*, 31: 126-132. (1920).

upon dried specimens. The only color notes from fresh material are those given by Hebard for specimens from fir, these being described as green. My material shows that the species presents a marked color dimorphism. Of the twenty specimens, eighteen were entirely green except that the antennae were dusky in both sexes while in the males the tarsi, tibiae and apical half of the femora were pinkish brown or pink. Two specimens, one of each sex, had the entire dorsum pink, the venter green, and the tarsi, tibiae and apical half of the femora pink.

The measurements given by Hebard appear also to have been made from dried specimens, the greatest length given being 19.8 mm. for the female and 14.5 for the male. My specimens, which were killed in Carnoy fluid, ranged from 22-24 mm. for the female and 15-18 mm. for the males.

With a knowledge of the host plant it is hoped that further notes as to the life history may be obtainable.—G. F. Ferris, Stanford University, California.

Insect Photography.

At the meeting of the Entomological Society of Belgium, Brussels, March 4, 1922, M. Bastin, of Antwerp, showed a photostereosynthesis (Lumière system) of a Dipter which, viewed as a transparency, gave the impression of astonishing reality. It had been obtained by the exact superposition of six photographs on glass, taken at the same magnification with the aid of a microscopic objective, at regularly increasing depths of the preparation. (Bull. Soc. Ent. Belg. iv, p. 41).

Chrysops costata Sucking Human Blood in Cuba (Dip.: Tabanidae).

Under the title *Sobre la mosca Chrysops costata Fabr. que chupa la sangre del hombre, observada en Cuba,* Dr. W. H. Hoffman has a note in *Sanidad y Beneficencia* (Boletin Oficial, Edicion Mensual, XXVI, No. 3, p. 121, Habana, Setiembre, 1921) describing his personal experiences in being bitten on the head about twelve times by flies which Dr. Walter Horn, of Berlin-Dahlem, identified as *Chrysops costata* Fabr. The flies bit the observer at various hours, both by day and by night, from October to February, in the grounds of Las Animas Hospital at Havana. Generally the flies had a little blood in the stomach and they made no attempt to escape from his hands. The bite was followed by considerable inflammation and pain. As other residents of the locality have not been bitten by this fly the observer suggests that his keeping his hair short, which is not the prevailing custom, exposes him to these attacks. He has not found this species elsewhere than on his own person. The transmission of *Filaria* by *C. dimidiata* in West Africa and of *Bacterium tularense* by *C. discalis* in Utah suggests to him the possibility that this Cuban species may also serve as a vector of disease.

Entomological Literature

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded.

The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

The records of papers containing new genera or species occurring north of Mexico are grouped at the end of their respective Orders.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

The titles occurring in the Entomological News are not listed.

2—Transactions of the American Entomological Society of Philadelphia. **4**—Canadian Entomologist, Guelph, Canada. **7**—Annals of The Entomological Society of America, Columbus, Ohio. **8**—The Entomologist's Monthly Magazine, London. **11**—Annals and Magazine of Natural History, London. **12**—Journal of Economic Entomology, Concord, N. H. **16**—The Lepidopterist, Salem, Mass. **19**—Bulletin of the Brooklyn Entomological Society. **20**—Bulletin de la Societe Entomologique de France, Paris. **22**—Bulletin of Entomological Research, London. **24**—Annales de la Societe Entomologique de France, Paris. **33**—Annales de la Societe Entomologique de Belgique, Brussels. **34**—Bulletin de la Societe Entomologique de Belgique, Brussels. **36**—Transactions of the Entomological Society of London. **44**—Ectoparasites. Edited by Jordan & Rothschild, Tring, England. **45**—Zeitschrift fur wissenschaftliche Insektenbiologie, Berlin. **50**—Proceedings of the United States National Museum. **52**—Zoologischer Anzeiger, Leipsic. **54**—Proceedings of the Biological Society of Washington, D. C. **62**—Bulletin of the American Museum of Natural History, New York. **67**—Le Naturaliste Canadien, Quebec. **68**—Science, Garrison-on-the-Hudson, N. Y. **69**—Comptes Rendus, des Seances de l'Academie des Sciences, Paris. **70**—Journal of Morphology, Philadelphia. **76**—Nature, London. **81**—The Journal of Parasitology, Urbana, Illinois. **96**—Physis. Revista de la Sociedad Argentina de Ciencias Naturales, Buenos Aires. **97**—Anales del Museo Nacional de Historia Natural de Buenos Aires. **100**—Biological Bulletin of the Marine Biological Laboratory, Woods Hole, Mass. **103**—Biologisches Centralblatt, Leipzig. **104**—Zeitschrift fur wissenschaftliche Zoologie, Leipzig. **106**—Anales de la Sociedad Cientifica Argentina, Buenos Aires. **111**—Archiv fur Naturgeschichte, Berlin. **114**—Entomologische Rundschau, Stuttgart. **116**—Entomologische Zeitschrift, Frankfurt a. M. **119**—Proceedings of the National Academy of Sciences of the U. S. A., Washington, D. C. **124**—Bulletin de la

Societe Entomologique d'Egypte, Cairo. **129**—The Bulletin of the Hill Museum, Witley, Surrey, England.

GENERAL. **Downing, E. R.**—A naturalist in the great lakes region. (Univ. Chicago Press, 1922, 328 pp., ill.) **Druce, H. H.**—Obituary. **8,** 1922, 211. **9,** 1922, 215. **Fahringer, J.**—Die feinde der schlammfliege. **45,** xvii, 113-24. **Gibson, A.**—A quoi sert l'entomologie? Benefices monetaires resultant des recherches entomologiques. **67,** xlix, 30. **Graef, E. L.**—Obituary notice. **19,** xvii, 43-5. **Greene, C. T.**—[Minutes of the Entomological Society of Washington. Discussions on the number of insects.] (Jour. Wash. Acad. Sc., xii, 335-40.) **Hayward, K. J.**—Colour-preservation in dragonflies. **9,** 1922, 209-10. **Hyslop, J. A.**—Summary of insect conditions throughout the U. S. during 1921. (U. S. D. A. Bull. 1103.) **Mast, S. O.**—Photic orientation in insects. **119,** viii, 240-5. **Morris, H. M.**—On a method of separating insects and other arthropods from soil. **22,** xiii, 197-200. **Mueller, R.**—Ueber vererbungslehre und entomologie. **114,** xxxix, 29-30 (cont.). **Sherborn, C. D.**—Index animalium.... 1801-1850. Sectio secunda. Part I. **Talbot, G.**—Nomenclature and illustrations. **129,** i, 366-7. **de la Torre Bueno, J. R.**—Color characters vs. structural characters. **19,** xvii, 63-4.

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OBITUARY NOTE.

We are indebted, in the first instance, to Dr. L. O. Howard, for the sad news of the death of Dr. David Sharp, which occurred at Brockenhurst on August 27. A notice of his life and work will appear in a later number of the News.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Buprestidae, Cleridae, and **Carabinae** wanted from U. S. or Buprestidae of the world. Will collect insects of any group (except Lepidoptera) in exchange or pay cash. Alan S. Nicolay, 416a Grand Ave., Brooklyn, New York.

For Exchange—A large number of live cocoons of Callosamia promethea, C. cynthia and P. cecropia for other pupae or Lepidoptera. D. C. Heim, Sunbury, Pa.

Wanted to Exchange—N. A. Coleoptera for same not in my collection. Carl Selinger, 4419 Dover St., Chicago, Ill.

Wanted for Cash or Exchange—Catocala eggs, also brilliant colored butterflies and moths for trays. Mrs. Robert Milde, Lewiston, Minn.

Syrphidae from all parts of North America wanted. Monographing the family.—C. H. Curran, Department of Entomology, University of Kansas, Lawrence, Kansas.

Will collect in all orders except Lepidoptera, in exchange for Cerambycidae (longicorn beetles) and Pentatomidae (stink-bugs). G. Chagnon, P. O. Box 521, Montreal, Canada.

I will collect Coleoptera and Lepidoptera in southwest Arkansas for those so interested.—Miss Louise Knobel, 417 West 2nd Avenue, Hope, Arkansas.

Correspondence solicited from anyone desiring general collections of insects, to be made in Costa Rica. Austin Smith, Apartado 412, San José, Costa Rica.

Wanted—For cash, during winter of 1922 and 1923, pupae of Saturniid moths. Please state species, quantity and price. P. Rau, 2819 S. Kingshighway, St. Louis.

Wanted—Am working on a Revision of the Buprestidae of the West Indies and would like to examine any material in this family from that region. W. S. Fisher, U. S. National Museum, Washington, D. C.

For Exchange—A large number of Papilio Turnus, P. Cresphontes and P. Ajax pupae, or the same specimens in papers, for other pupae or Lepidoptera. Carl Selinger, 4419 Dover St., Chicago, Ill.

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Brahmaea wallachi

And Many Other Showy Species

From Tibet (Bhutan):

Armandia lidderdalii
Parnassius hardwicki

CATALOGUES OF
ENTOMOLOGICAL SUPPLIES AND SPECIMENS
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